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Drinking Water Engineering and Science Discussions

Interactive comment on "Reliability of water distribution networks due to pumps failure: comparison of VSP and SSP application" *by* N. Mehzad et al.

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General comments

This paper presents a methodology to evaluate the reliability of pumping stations and this topic is of interest for the Drinking Water Engineering and Science readers. The text is well organized but it should be reviewed by someone whose mother thong is the English.

The reliability is here evaluated by using a sort of performance index, which authors call "fuzzy relationships", that indirectly measures the amount of demand that can be fulfilled (in terms of available pressure at each node) in different failure scenarios, and each scenario corresponds to a pump(s) failure.

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Authors present three different equations to evaluate this reliability (although there is no justification for this choice): Eqs. (1) and (2) are "original" and Eq. (3) was taken from Tabesh and Zia (2003).

In my opinion, the use of Eq. (1) could/should be omitted. As authors mention, it doesn't take into account the maximum pressure allowed in the network and it assigns maximum reliability to any pressure above the desirable pressure. This index doesn't make sense. Eq. (2) is a simplistic way to envisage the performance of water distribution networks. But it makes some sense.

I think that Eq. (3) is from far the best as it is more close to the performance that a water distribution network should present.

The final value for the reliability takes in consideration the probabilities assigned to each failure scenario. However, authors don't mention anything about the values adopted for these probabilities.

Although the presented methodology is interesting, it would be much more realistic to use a Pressure Driven Demand model and evaluate directly the amount of demand that can be fulfilled and evaluate the reliability with it.

After reading the text I got the idea that the proposed methodology assumes that the network is fed by one single pumping station, which may contain several pumps. I wonder if the authors thought how they would apply it to networks fed by more than one pumping station.

Specific comments

Some references have wrong names, like: "Tanyiemboh" and "Goupta".

In Eq. (1) if HMIN is different from 0, when HAV=HMIN Coef is not 0. Is really this the authors intention?

Authors should be careful with the term "minimum absolute standard pressure", it may

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introduce some confusion between absolute and relative pressures.

In Eq. (5) shouldn't NP be equal to the number of different failure scenarios considered (it may be different from the number of pumps)?

In the case study, the operating points of the pumping station seems somehow strange: with two pumps in parallel the discharge doubles (the system curve is flat in this range – 0.0 to 1.4 ?); introduction of the third or the fourth pump gives the same increase in the discharge (once again the system curve is flat in that range – 1.4 to 2.4?). But if we look at Figure 4, it seems that the operating points are: 1 pump – 0.7; 2 pumps – 1.3; 3 pumps – 1.9; 4 pumps – 2.3, and these seem to be more realistic.

If there is no tank in the network, how is it fed? In Figure 3 we can see a reservoir. What is the physical meaning of this reservoir? The network feeding point has a constant head?

"In Table 2, the calculated negative reliabilities were replaced by 0." Looking at Eqs. (1), (2) and (3) I don't see how there can be negative reliabilities. Could the authors please explain this?

". . .the costs of the electricity consumption are 694.78 $ kw−1 and 597.75 $ kw−1 . . .". What is the meaning of "$ kw−1"? If we are talking about costs shouldn't it be just "$"?

Interactive comment on Drink. Water Eng. Sci. Discuss., 5, 351, 2012.